

Standard PS-4: The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.

Supporting Content Web Sites

The University of Sheffield and WebElements Ltd, UK

<http://www.webelements.com/>

This is the ultimate site for information on the periodic table and the elements.

PS-4.1-4.3, 4.5

Harmsy

<http://www.harmsy.freeuk.com/jigsaw.html>

This site has printable puzzle pieces that students can use to construct formulas.

PS-4.5

FunBased Learning

<Http://funbasedlearning.com/chemistry/default.htm>

This site is for learning to write formulas and balancing equations. Do it all in one hour-even with remedial students! This is a fun site!!!

PS 4.6, 4.8, 4.10, 4.11

Vision Learning – National Science Foundation

<http://www.visionlearning.com/library/>

This site explains the role of bonding in achieving chemical stability in both ionic and molecular substances. It illustrates the fact that ions attract ions of opposite charge and form crystal lattices. Many other topics are explained on this site!!

PS-4.1- 3, 4.9 - 10

Chem4kids

<http://www.chem4kids.comT>

This site addresses atom basics, elements, chemical reactions and other chemistry topics.

PS- 4.6, 4.8

Cavalcade O' Chemistry

www.chemfiesta.com

This site has many lab activities and worksheets for chemical reactions, ionic and molecular compounds, and many other teacher help.

PS-4.4, 4.5, 4.7, 4.9, 4.10.

Associated Chemistry Teachers of Texas

http://www.statweb.org/ACT2/labs_demos.htm

This site is a great source for Physical Science labs and demos. Use! Use! Use!

PS-4.3 -4.5

QuiaWeb

<http://www.quia.com/jq/19617.html>

This site has much information about bonding as well as an interactive quiz that assesses knowledge of the principles behind chemical bonding. It also contains many other sources of help for teachers of chemistry.

PS-4.1, 4.3-5

General Chemistry Online

<http://antoine.frostburg.edu/chem/senese/101/>

This is a rich source for activities and it is an interactive site.

PS-4.7, 4.9 -10

Science Help Online – Fordham Preparatory School

<http://www.fordhamprep.org/gcurran>

This is a chemistry lessons site but there are many worksheets and much information that is appropriate for Physical Science.

PS-4.1 – 4.11

Suggested Literature

Sachs, Oliver (2001). **Uncle Tungsten.** New York: Alfred A Knopf

ISBN 0-375-40448-1

Lexile: NA

The book weaves together the wonders of chemistry and the boyhood experiences of Oliver Sachs. Follow his experiments of “stinks and bangs” under the tutelage of his “chemical” uncle. Numerous reactions are featured as well as his heroes, Humphrey Davy and Marie Curie.

PS-4.7 - 4.9.

Platt, Richard (2005). **Forensics (Kingfisher Knowledge).** Kingfisher/Houghton Mifflin Company

ISBN 0-7534-5862-4

Lexile: NA

This book presents the real information behind TV shows like CSI. The author condensed the topic of forensics into three major areas: Signs of the Crime, Who Is It?, and Crime Lab. The aspiring forensic scientist can gain a wealth of information on such topics as evidence collection, DNA analysis, and fingerprinting.

PS-4.9

Holden, Alan (1982). **Crystals and Crystal Growing**. Cambridge: MIT Press

ISBN: 0-262-58050-0

Lexile: NA

This book gives step-by-step instructions for growing crystals.

PS-4.3

Rohrig, Brian (2002). **150 Captivating Chemistry Experiments Using Household Substances**. Columbus, OH: Fizzbang Science

ISBN: 0-9718480-2-5

Lexile: NA

This book uses common household substance to teach students about chemical reactions and changes.

PS-4.7 - 4.12

Rohrig, Brian (2002). **150 More Captivating Chemistry Experiments Using Household Substances**. Columbus, OH: Fizzbang Science

ISBN: 0-9718480-1-7

Lexile: NA

This book uses common household substance to teach students about chemical reactions and changes.

PS-4.7 - 4.12

Gardner, Robert. (2000). **Science projects About the Science Behind Magic**. Berkeley Heights, NJ: Enslow Publishers, Inc.

ISBN: 0-7660-1164-X

Lexile: NA

Five groups of suggested experiments that can be performed as magic demonstrations are included. One of these groups is related to fundamental chemical effects. Young readers with inquisitive minds will be motivated to dig deeper.

PS- 4.7 - 4.9

Taylor, C. and Pople, S. (1995). **The Oxford Children's Books of Science**. New York: Oxford University Press

ISBN: 0-19-5215353-4

Lexile: NA

This book is divided into 22 sections covering the worlds of chemistry, physics and biology. The emphasis is on the “what and why” and is visually captivating.

PS-4.4, 4.7 – 4.9

Lister, T. (2005). **Kitchen Chemistry**. London: The Royal Society of Chemistry
ISBN: 0854043896

Lexile: NA

All food is made of chemicals so cooking can be thought of as a series of chemical reactions. This book consists of a variety of activities including class practical, demonstrations, paper-based activities. The approach can be stimulating for many students.

PS-4.7 - 4.9, 4.12

Greenberg, B. (1998). **Art in Chemistry**. Ontario: Teachers Ideas Press.

ISBN: 1-56308-487-2

Lexile: NA

The disciplines of art and chemistry may seem worlds apart but this excellent book brings them together - resulting in a meaningful, relevant and interesting new way of helping students grasp basic chemistry concepts. The abstract nature of chemistry can be explored in a way that helps students better visualize these concepts and thus better understand them.

PS-4.7 – 4.9

Gonick, L. (20005). **The Cartoon Guide to Chemistry**. New York: Harper Collins

ISBN: 0-06-093677-0

Lexile: NA

You don't need to be a scientist to grasp these and many other complex ideas, because this work explains them all: the history and basics of chemistry, atomic theory, combustion, solubility, reaction stoichiometry, the mole, entropy, and much more -- all explained in simple, clear, and yes, funny illustrations. Chemistry will never be the same!

PS-4.8 - 4.12

Suggested Streamline Video Resources

Physical Science: Elements, Compounds, and Atoms

ETV Streamline SC

Students will learn about elements and the chemical symbols used to represent them.

They will also learn how elements combine to form compounds, as well as the difference between atoms and molecules.

Compounds (3:59)

PS-4.5

Physical Science Series: Chemical Bonding

ETV Streamline SC

Students will be introduced to the nature of chemical bonding and the characteristics of atoms that allow them to form bonds.

Introduction (1:15)

Atoms and Bonding (1:40)
Electrons and Energy Levels (1:01)
Stability and Chemical Bonds (1:37)
Common Types of Atomic Bonds (7:22)
Ionic Bonds (2:18)
Structure of Ionic Bonds (0:54)
Covalent Bonds (1:23)
PS-4.1 - 4.4

Elements of Chemistry: Compounds and Reactions

ETV Streamline SC

Elements bond together into compounds and it is these compounds that make up the great variety of substances. Students explore how different types of compounds are formed, and examine the chemical reactions of elements when they bond into other substances.

Ionic Bonds (3:21)
Covalent Bonding (4:07)
Chemical Reactions (3:29)
PS- 4.1-4.3 and 4.6-4.9

Physical Science Series: Chemical Reactions

ETV Streamline SC

This program introduces chemical equations and shows students how to balance chemical equations via colorful animation. Synthesis, decomposition, and replacement reactions are described. The energy dynamics and rates of reactions are explored.

Introduction to Chemical Reactions (0:49)
Traits of Chemical Reactions (1:48)
Chemical Equations (1:53)
Four Types of Chemical Reactions (3:12)
Exothermic and Endothermic Reactions (0:55)
Rates of Chemical Reactions (1:50)
PS – 4.6-4.11

Changes in the Properties of Matter: Physical and Chemical

ETV Streamline SC

This program has segments on chemical and physical changes.

Chemical Properties (1:16)
Physical Changes (6:43)
Chemical Changes (6:10)
PS - 4.6

Chemistry Connections: Corrosion Reactions

ETV Streamline SC

This program is excellent for explaining rusting of iron.

Suggested Segments:

Rust, the Corrosion of Iron (9:59)
Galvanizing (6:02) PS - 4.6

Simply Science: Reaction Equations

ETV Streamline SC

This program discusses formation and decomposition reactions; how to predict and test compound classification as ionic, molecular, acid or base; how to name the compounds involved; the law of conservation of mass; and how to balance equations.

Evidence of Reactions (2:44)

Formation Reactions (4:06)

Classifying Compounds (9:07)

Naming Compounds and Balancing Equations (5:33)

Decomposition Reactions (2:17)

PS - 4.4. - 4.10

Career Connections

Agricultural Chemists focus on chemical compositions and changes involved in the production, protection, and use of crops and livestock. Agricultural chemists study the causes and effects of biochemical reactions related to plant and animal growth, seek ways to control these reactions and develop chemical products. PS-4 requires a beginning understanding of basic composition and chemical changes as well as rates of reactions.

Analytical Chemists perform qualitative and quantitative analysis. They use their knowledge of chemistry, instrumentation, computers, and statistics to solve problems in almost all areas of chemistry. The basic ideas incorporated in PS-4 are extended to all aspects of research in industry, academia, and government.

Chemical Technicians play a vital role in a variety of industries, working with chemists and chemical engineers to develop, test, and manufacture chemical products. Their opportunities are diverse, depending on where they work, and their education, skills and experience. They operate standard laboratory equipment; set up apparatus for chemical reactions; perform chemical tests and experiments that involve various procedures; test for quality, performance or composition; and conduct a variety of laboratory procedures. The skill of technicians begins with the understanding of the chemistry concepts in PS-4.

Chemical Education is a challenging and rewarding job. Helping students grow, develop, and seek their potential is a tremendously inspiring job where one is always engaged in the practice and process of chemistry on a daily basis. PS-4 requires explanations for the way substances interact and is good beginning preparatory work for future teachers.

Chemical Engineers apply the principles of chemistry, math, and physics to the design and operation of large-scale chemical manufacturing processes. They translate processes developed in the lab into practical applications for the production of products such as plastics, medicines, detergents, and fuels; design plants and evaluate plant operations. The concepts of PS-4 are essential for such a career.

Chemical Information Specialists manage technical information in a variety of ways. Reading and analyzing data as in the PS-4 standard is good training for such a job. Presentation and organization of information is also a component. Opportunities in chemical information include being a scientific librarian, a technical publisher, a software developer, or market researcher.

<http://mail.sci.ccny.cuny.edu/~phibarn/careers.html> This site has numerous links

Chemical Sales is a synergy of scientific and business expertise. This field combines business and technical expertise. Two-thirds of marketers in the chemical industry have a technical degree. Today, scientific inquiry is more geared toward product development. Those who understand the properties and uses of materials as in PS-4 but who are well-suited to the more social aspects of marketing would enjoy a career in chemical sales.

Forensic Chemists apply knowledge from diverse disciplines such as chemistry, biology, materials science, and genetics to the analysis of evidence found at crime scene or on/in the bodies of crime suspects. The results of their work are used in police investigations and court trials, at which they may be called upon to provide expert testimony and explain their findings to a jury. The concepts in PS-4 are embedded in such work.

Materials Scientists are concerned with the relationship between the structure and properties of materials such as PS-4 addresses. They are generally employed by industry or in laboratories where the focus is on developing product-related technologies. Persistence is highly desired in this field. Companies whose products include metals, ceramics, rubber, coatings, superconducting materials, and implants employ material scientists.

Science Writers and editors spend most of their time writing or reviewing articles and article proposals. They must keep up-to-date on major scientific and technical developments by reading press releases, articles, and original research papers. They attend science and technology conferences to report on discoveries presented there. They interview scientists and engineers and conduct literature searches. The ability to write imaginative and organized lab reports of PS-4 activities would be helpful when considering such a career.

www.chemistry.org.

[Chemical Careers in Brief](#) - Students can explore 30 different careers in chemistry. Each brief includes information on educational requirements, employment outlook, salaries, and the skills needed to pursue a career in each field. This is the website of the American Chemical Society.

<http://www.southwestern.edu/academic/chemistry.dept/chem-careers.html>

This site is an excellent one for careers. There are lists of careers, links and books listed.

Kahn, Jetty.(2000). **Women in Chemistry Careers**. Capstone This work describes the careers of five women working in the field of chemistry.

ISBN: 0-7368-0315-7 Lexile: 720